

REMARKS

Initially, Applicants thank the Examiner for finding allowable matter in claims 14, 15, and 19. Applicants have cancelled claims 42-44 without prejudice. Importantly, 5 Applicants have cancelled no claims for any reasons related to patentability. Applicants reserve the right to prosecute any and all cancelled claims in one or more continuation, continuation-in-part, or divisional applications. Applicants believe that the foregoing 10 amendments and the comments that follow will convince the Examiner that the rejections and objections provided in the December 18, 2002 Office Action have been overcome and should be withdrawn.

15 I. THE INVENTION

The present invention is generally an improved centrifugal separator capable of separating even fine particulate from a fluid flow. Importantly, this centrifugal separator requires no filters, vacuum bags, or 20 liquid baths because it utilizes a highly efficient fluid flow. Thus, separation performed by the present invention is efficient and low-maintenance.

The preferred embodiment of the present invention utilizes concentric tubing for input and output ducts.

Specifically, an inner tube is coaxially disposed within an outer tube such that fluid may flow into the separator via the inner tube and exit the separator via the annular duct formed between the inner and outer tubes. A toroidal
5 vortex nozzle may be formed at the end of the inner and outer tubes to create a toroidal vortex vacuum system. However, the present invention can be used in any system that requires the separation of matter from fluid flow.

The separation of the present invention occurs in a
10 separation chamber, and the separated matter is collected in a collector located on the side of the separation chamber. Preferably, an impeller is implemented to move fluid flow through the system. In operation, the centrifugal separation proceeds as follows: fluid flow is
15 pulled into the inner tube via suction created by the impeller; the impeller spins the fluid flow (at its blade speed) into a cylindrical vortex; the fluid flow travels along the wall of the separation chamber while matter is centrifugally ejected into the collector; and cleaned fluid
20 flow is expelled out the annular duct between the inner and outer tubes.

Importantly, the present invention has numerous advantages over conventional separation devices in the art. First, the impeller fulfills the dual purpose of providing

the necessary suction and spinning the fluid flow into a cylindrical vortex. Consequently, fluid flow can be spun at extremely high speeds. Also, a pressure exceeding the pressure in the separation chamber is developed inside the collector. This higher pressure helps maintain the cylindrical vortex fluid flow without impeding the matter from being centrifugally ejected into the collector. Because separation is centrifugal, separators of the present invention may operate in any orientation independently of gravity. Additionally, the high speed vortex allows even small particulate to be separated without the use of filters, vacuum bags, or liquid baths that compromise the fluid flow's efficiency. Moreover, only smooth directional changes are made to the fluid flow, allowing for an energy efficient flow design. Consequently, the present invention provides a highly efficient separation system that is simple in design and requires virtually no maintenance.

20 II. THE EXAMINER'S OBJECTIONS

A. OATH/DECLARATION

The Examiner has required an oath or declaration for the subject application.

B. DRAWING REJECTIONS UNDER 37 C.F.R. 1.83(a)

The Examiner has objected to the drawings under 37 C.F.R. 1.83(a) for not showing the propellers in claims 10, 28, and 46.

5 C. PRIORITY

The Examiner has objected to the "Cross Reference to Other Applications" for indicating that co-pending application Ser. No. 09/835,084, filed 4/13/2001, is a continuation-in-part of application Ser. No. 09/829,416, 10 filed 4/9/2001. The Examiner contends that that the latter application does not belong in the continuity structure of the subject application.

D. CLAIMS

The Examiner objected to claims 5, 6, 11, 12, 23, 24, 15 29, and 30 under 37 C.F.R. 1.75(c) for being in "improper dependent form for failing to further limit the subject matter of a previous claim." (page 3) Specifically, the Examiner argues that these claims fail to further limit the structure of their respective base claims.

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III. THE EXAMINER'S REJECTIONS

A. 35 U.S.C. § 112

The Examiner rejected claims 2-4, 12-15, 19-35, 37, and 39 under 35 U.S.C. § 112 as being indefinite. First,

the Examiner argues that the fluid delivery means cannot comprise a motor (claims 2-4 and 19). Furthermore, the Examiner finds the phrase "such as" indefinite (claims 12 and 30). Also, the Examiner requires that "structural
5 connectivity" be indicated for the inner and outer tubes (claims 13-15, and 41). Additionally, the Examiner finds lack of antecedent basis for "said centrifugal separation chamber" (claims 19-35, 39, and 40). The Examiner also finds a lack of antecedent basis for "said annular duct"
10 (claim 41).

B. 35 U.S.C. § 102(b)

Additionally, the Examiner has rejected claims 1-13, 17, 18, and 42-44 under 35 U.S.C. § 102(b) as being anticipated by Crane et al. U.S. Pat. No. 2,192,515
15 (hereinafter referred to as "Crane"). The Examiner contends that Crane teaches a system comprising a fluid delivery means being a centrifugal impeller assembly, a cylindrical separation chamber, a collector comprising a removable door, and an inner tube and an outer tube forming
20 an annular duct.

The Examiner also rejected claims 36-40 and 45-47 under 35 U.S.C. § 102(b) as being anticipated by Crane. The Examiner submits that:

- Crane teaches a separation method comprising the steps of delivering a fluid flow to a separation chamber and allowing matter to carry into a collector.
- 5 • Crane teaches fluid flow being delivered from an inner tube and exiting via an annular duct.
- Crane utilizes a pressure differential between a collector and a separation chamber to maintain circular fluid flow.
- 10 • Crane teaches delivering fluid flow with an impeller assembly that creates a cylindrical vortex fluid flow.

Additionally, the Examiner rejected claims 1-7, 9, 11,
15 12, 16, and 44 under 35 U.S.C. § 102(b) as being anticipated by McKnab U.S. Pat. No. 3,174,264 (hereinafter referred to as "McKnab"). The Examiner claims that McKnab teaches a system comprising a fluid delivery means with a centrifugal pump assembly connected to a motor, a
20 cylindrical separation chamber, and a removable collector.

Further, the Examiner rejected claims 36 and 47 under 35 U.S.C. § 102(b) as being anticipated by McKnab. The Examiner contends that McKnab teaches a separation method including the steps of delivering a fluid flow (with a

centrifugal pump) to a separation chamber and allowing matter to carry into a collector.

The Examiner rejected claims 36 and 39 under 35 U.S.C. § 102(b) as being anticipated by Bauer U.S. Pat. No. 3,426,513 (hereinafter referred to as "Bauer"). The Examiner argues that Bauer teaches a separation method including delivering a fluid flow to a separation chamber and allowing matter to carry into a collector. Additionally, the Examiner contends that Bauer creates a higher pressure in the collector than in the separation chamber.

IV. THE EXAMINER'S OBJECTIONS AND REJECTIONS SHOULD BE WITHDRAWN

15 A. OATH/DECLARATION

The Examiner has stated that the Declaration previously submitted is not an acceptable Declaration for the present application. Applicants have attached a newly executed declaration herewith.

20 B. DRAWINGS

The Examiner has objected to the drawings under 37 C.F.R. 1.83(a) for not showing the propellers in claims 10, 28, and 46. In response thereto, Applicants have included

propeller 1701 in newly added FIG. 17. No new matter has been added.

C. PRIORITY

The Examiner has objected to the "Cross Reference to
5 Other Applications" for indicating that co-pending
application Ser. No. 09/835,084, filed 4/13/2001, is a
continuation-in-part of application Ser. No. 09/829,416,
filed 4/9/2001. Applicants respectfully submit that U.S.
Pat. Publication Pub. No. US 2002/0020035 incorrectly omits
10 application Ser. No. 09/829,416. Application Ser. No.
09/835,084, as filed, includes the aforementioned
application (by title only, because a serial number was not
yet assigned) in its continuity structure. Therefore,
Applicants submit that the continuity structure of the
15 current application is correct.

D. CLAIM OBJECTIONS UNDER 37 C.F.R. 1.75(c)

The Examiner objected to claims 5, 6, 11, 12, 23, 24,
29, and 30 under 37 C.F.R. 1.75(c) for being in "improper
dependent form for failing to further limit the subject
20 matter of a previous claim." (page 3) In response thereto,
Applicants have amended claims 5, 6, 23, and 24 to teach
fluid delivery means powered by various motors. With
respect to claim 11 and 29, Applicants have amended these
claims to require configuration of the separation chamber

and the collector to create a pressure differential therebetween. Regarding claims 12 and 30, Applicants have amended these claims to more specifically define the term "matter" of their respective base claims.

5 E. CLAIM REJECTIONS UNDER 35 U.S.C. § 112

 The Examiner rejected claims 2-4, 12-15, 19-35, 37, and 39-41 under 35 U.S.C. § 112 as being indefinite. The Examiner rejects claims 2 and 19 for reciting "said fluid delivery means comprises a motor." Applicants believe that
10 the Examiner intended to reject claims 2 and 20 because claim 19 does not contain the Examiner's quoted language while claim 20 does. In response thereto, Applicants have amended claims 2 and 20 to indicate that the fluid delivery means is powered by a motor. With respect to claims 12 and
15 30, Applicants have eliminated the phrase "such as" from these claims. Regarding claims 13-15, and 41, Applicants have amended these claims to include structural connectivity between the inner tube and the outer tube. With regard to claims 19, 39, and 40, Applicants have
20 amended "said centrifugal separation chamber" to read "said separation chamber" which has antecedent basis in claim 19 and base claim 36. Concerning claim 37, Applicants have added structural connectivity for the inner tube. With regard to claim 41, Applicants have removed "said annular

duct." The remaining claims have been rejected for being dependent on indefinite base claims. Because all base claims have been amended and are no longer indefinite, Applicants submit that claims 21-29 and 31-34 are also no longer indefinite.

F. CLAIM REJECTIONS UNDER 35 U.S.C. § 102(b)

The Examiner has rejected claims 1-13, 17, 18, and 42-44 under 35 U.S.C. § 102(b) as being anticipated by Crane. Claims 42-44 have been cancelled without prejudice.

Applicants direct the Examiner to newly amended claim 1. Crane provides a system that throws dust against a wall of a cylindrical chamber. The dust is then carried downward with airflow until the bottom of the funnel is reached. Next, the airflow is directed upward while the dust falls into the dust collecting chamber. Importantly, Crane utilizes gravity to pull the dust downward into the dust collecting chamber. The present invention, on the other hand, centrifugally ejects matter into a collector. Thus, the removal of matter from fluid flow in the present invention does not necessitate assistance from gravity. As a consequence, separators of the present invention may function in any orientation. Newly amended claim 1 reflects this behavior by indicating that "said fluid flow centrifugally ejects said matter therefrom into said

separation chamber." Crane does not centrifugally eject matter into the dust collecting chamber. Rather, Crane allows dust to drop into the chamber. Thus, claim 1 is not anticipated by Crane. Claims 2-13, 17, and 18 are dependent on claim 1 and consequently, contain all the limitations thereof. Therefore, these claims are also not anticipated by Crane.

Also, the Examiner rejected claims 36-40 and 45-47 under 35 U.S.C. § 102(b) as being anticipated by Crane. Applicants direct the Examiner to newly amended claim 36. As argued *supra*, Crane does not teach centrifugal ejection of matter into the dust collecting chamber. In contrast, newly amended claim 36 includes the step of "centrifugally ejecting said matter into a collector." Thus, Applicants submit that claim 36 is not anticipated by Crane. Claims 37-40 and 45-47 are dependent on claim 36 and consequently, contain all the limitations thereof. Therefore, these claims are also not anticipated by Crane.

Additionally, the Examiner rejected claims 1-7, 9, 11, 12, 16, and 44 under 35 U.S.C. § 102(b) as being anticipated by McKnab. Claim 44 has been cancelled without prejudice. Applicants direct the Examiner to newly amended claim 1. Similar to Crane, McKnab utilizes gravity to separate dirt from airflow. In McKnab, however, airflow is

swirled within a barrel-shaped chamber such that dirt is thrown against the walls. The dirt is then pulled by gravity to the bottom of the chamber. The present invention does not need gravity for separating matter from
5 fluid flow. Rather, matter is centrifugally ejected into a collector as taught in newly amended claim 1. Thus, Applicants respectfully submit that claim 1 is not anticipated by McKnab. Claims 2-7, 9, 11, 12, and 16 are dependent on claim 1 and consequently, contain all the
10 limitations thereof. Therefore, these claims are also not anticipated by McKnab.

The Examiner rejected claims 36 and 47 under 35 U.S.C. § 102(b) as being anticipated by McKnab. Applicants direct the Examiner to newly amended claim 36. As argued *supra*,
15 McKnab does not teach centrifugal ejection of matter into a collector. Newly amended claim 36, however, includes the step of "centrifugally ejecting said matter into a collector." Thus, Applicants submit that claim 36 is not anticipated by McKnab. Claim 47 is dependent on claim 36
20 and contains all the limitations thereof. Thus, claim 47 is also not anticipated by McKnab.

The Examiner rejected claims 36 and 39 under 35 U.S.C. § 102(b) as being anticipated by Bauer. Applicants direct the Examiner to newly amended claim 36. Like Crane and

McKnab, Bauer teaches a separator that throws particles into the walls of a chamber. However, the particles are not centrifugally ejecting into a collector as taught by newly amended claim 36. Rather, the particles drop into a
5 dust collector chamber with the assistance of gravity. Specifically, particles are pulled by gravity in the axial direction when Bauer's apparatus is vertically oriented. In a horizontal orientation, particles are pulled by gravity into the dust collector chamber. Thus, claim 36 is
10 not anticipated by Bauer. Claim 39 is dependent on claim 36 and consequently, contains all the limitations thereof. Therefore, claim 39 is also not anticipated by Bauer.

In accordance with the Examiner's suggestions, Applicants have rewritten claims 14 and 15 in independent
15 form.

Applicants respectfully submit that neither Crane, McKnab, nor Bauer disclose a higher pressure in a collector than in a separation chamber to maintain a cylindrical vortex fluid flow without impeding matter from carrying
20 into the collector as the Examiner has argued.

In light of the foregoing amendments and remarks, Applicants submit that the specification, drawings, and all pending claims are now in condition for allowance.

CONCLUSION

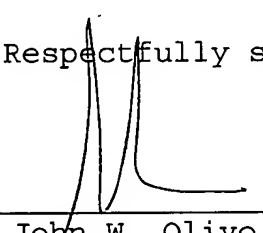
Applicants submit that all pending claims represent a patentable contribution to the art and are in condition for allowance. Early and favorable action is accordingly
5 solicited.

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Date: _____

4/1/03

Respectfully submitted,



John W. Olivo, Jr.
Reg. No. 35,634
Ward & Olivo
382 Springfield Ave.
Summit, NJ 07901
908-277-3333

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